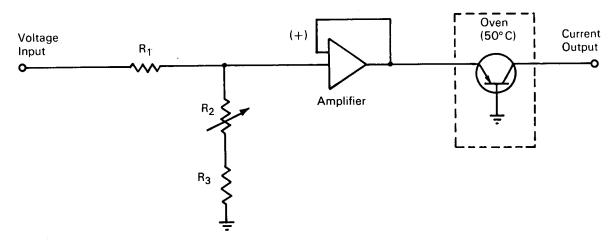


# **AEC-NASA TECH BRIEF**



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# Microcurrent Generator Produces Electrical Currents Accurately between 10<sup>-11</sup> Ampere to 10<sup>-3</sup> Ampere



## The problem:

To test low current devices such as ion chambers a current generator was needed to accurately simulate currents in the range of  $10^{-11}$  ampere to  $10^{-3}$  ampere.

#### The solution:

An electronic circuit design that uses operational amplifiers, current dividers and a transistor such that the current output equals antilog  $(V_{input}/K)$ , where K is determined by circuit parameters.

#### How it's done:

The microcurrent generator shown has the required characteristics, i.e.,  $V_{\rm in} = K \log V_{\rm out}$ . The voltage divider (R<sub>2</sub>) is used to set the value of K. For this particular circuitry to produce a current change of one decade, the voltage at the output of the operational amplifier must change by approximately 60 millivolts. Stabilizing the transistor by placing it in a a temperature controlled oven at 50°C provides a low current limitation of the circuit of  $10^{-10}$  ampere. The circuit is adjusted so that each time the input voltage

changes 2 volts in range, a change in current of one decade is produced. For example: a change from 2 to 4 volts provides a current change of one decade; a change of 2 to 8 volts results in a current change of 3 decades, etc.

#### Notes:

1. For the circuit shown:

$$I_{out} = 10^{-11} \text{ antilog } (V_{in}/2 + 2)$$

- 2. Compensation networks have been devised to improve the accuracy at the lower current levels.
- 3. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer
AEC-NASA Space Nuclear Propulsion
Office

U.S. Atomic Energy Commission Washington, D.C. 20545 Reference: B66-10706

(continued overleaf)

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### Patent status:

No patent action is contemplated by AEC or NASA.

. Source: J. Wilson of Westinghouse Astronuclear Laboratory under contract to AEC-NASA Space Nuclear Propulsion Office (NU-0087)